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LONG LAKE, AROOSTOOK COUNTY, MAINE

Pacific Northwest Environmental Research Laboratory

Prepared for:

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

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REPORT
ON
LONG LAKE
AROOSTOOK COUNTY
MAINE
EPA REGION I
WORKING PAPER No. 7

WITH THE COOPERATION OF THE
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
AND THE
MAINE NATIONAL GUARD
MAY, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 as a research project in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations and impact on selected fresh water lakes as a basis for formulating comprehensive and coordinated national, regional and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations and impacts can, in fact, be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

This report documents the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin. It is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/ standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Maine Department of Environmental Protection for professional involvement and to the Maine National Guard for conduct of the tributary sampling phase of the Survey.

William R. Adams, Commissioner of the Department of Environmental Protection, and William P. Hinckley and Matthew Scott of the Division of Lakes and Biological Studies, provided invaluable lake documentation and counsel during the course of the study.

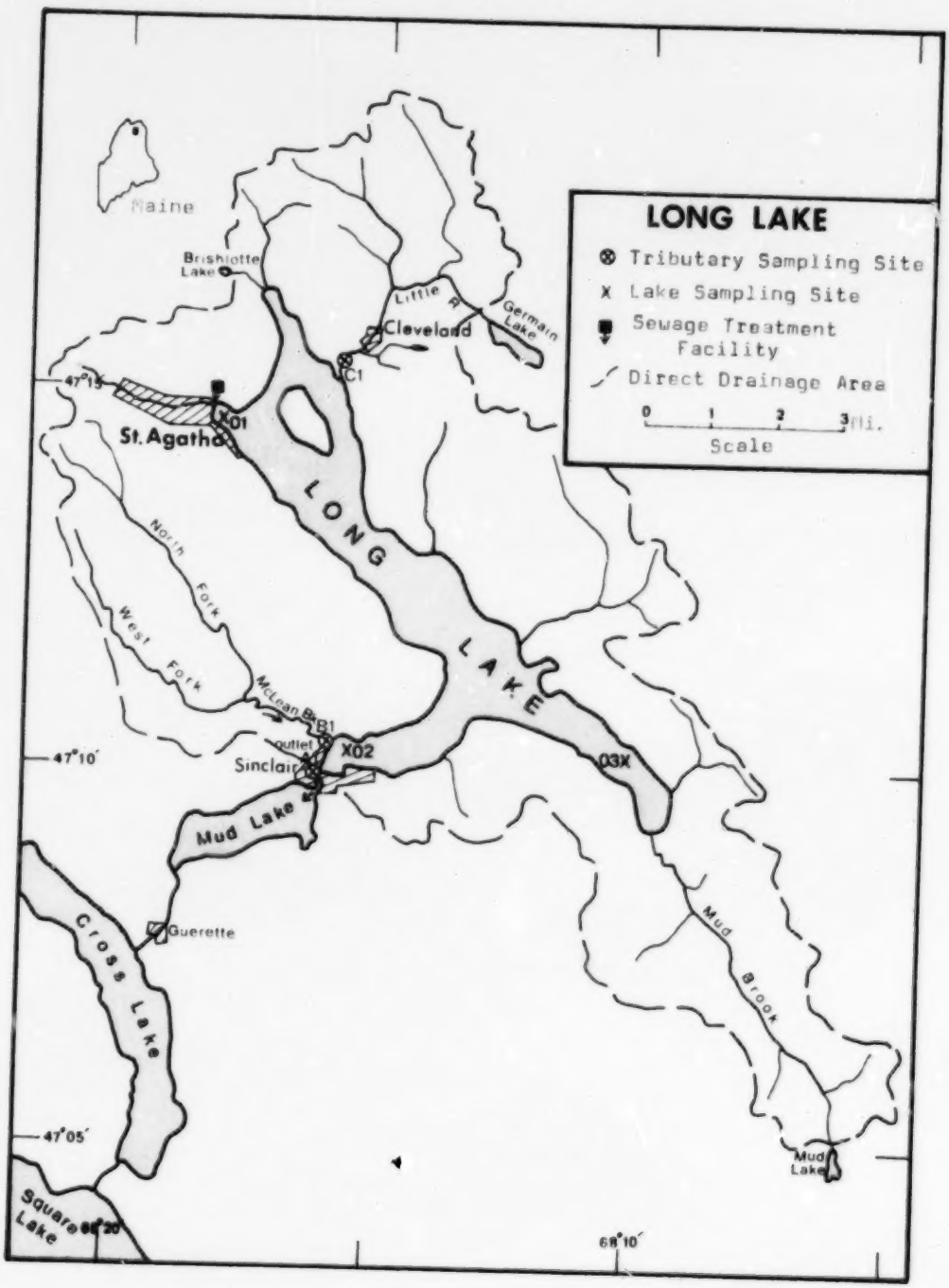
Major General Edwin W. Heywood (Retired), then the Adjutant General of Maine, and Project Officer Lieutenant Colonel Earl B. Adams who directed the volunteer efforts of the forty-one participating Maine National Guardsmen are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF MAINE

LAKE NAME	COUNTY
Moosehead Lake	Piscataquis, Somerset
Estes Lake	York
Long Lake	Cumberland
Bay of Naples & Sebago Lake	Cumberland
Rangeley Lake	Franklin
Long Lake	Aroostook
Mattawamkeag Lake	Aroostook
Sebasticook Lake	Penobscot


LONG LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Direct Drainage Area
0 1 2 3 Mi.
Scale
Maine
Brishlotte Lake
Little R.
Germain Lake
Cleveland
C1
47°15'
X01
St. Agatha
LONG LAKE
North Fork
West Fork
McLean Br.
B1
outlet
X02
47°10'
Sinclair
03X
Mud Lake
Guerette
Cross Lake
Mud Brook
47°05'
Square Lake
68°20'
68°10'
Mud Lake

LONG LAKE, AROOSTOOK COUNTY

STORET NO. 2313

I. CONCLUSIONS

A. Trophic Condition:

The low levels of primary nutrients and low control yield of the algal assay as observed during the Survey and deep water oxygen depression reported by Maine agencies indicate that Long Lake is mesotrophic.

B. Rate-Limiting Nutrient:

The results of the algal assay indicate that Long Lake was phosphorus limited at the time the sample was collected. Field data also indicate phosphorus limitation.

C. Nutrient Sources; Controllability:

1. Point Sources - Other than septic tanks, the only point source of nutrients to Long Lake is the St. Agatha Sanitary District waste treatment facility. Phosphorus removal at this source would not be expected to result in any observable change in the trophic condition of Long Lake.

2. Non-Point Sources - Export of nutrients from diffuse sources represent over 85% of calculated total nitrogen and phosphorus loadings. In view of the proximity of present phosphorus loading rates to the predicted "permissible" limits, continued assessment of cultural practices within the Long Lake watershed should be maintained.

II. INTRODUCTION

Long Lake, Aroostook County, is the uppermost and deepest major lake in the Fish River chain of lakes which are tributary to the St. John River. The St. John River forms the major portion of the Maine-New Brunswick, Canada, border.

Long Lake is considered one of the best cold-water lakes in northern Maine from a fish management point of view, and water quality is said to be ideal for landlocked Atlantic salmon, Salmo salar (introduced), and brook trout, Salvelinus fontinalis. Both of these species are relatively intolerant of environmental extremes.

In addition to excellent fishing, other recreational uses of the lake include aesthetics, camping, swimming, and boating. The State of Maine maintains a public boat-launching site near the village of St. Agatha.

Although the lake is not utilized as a public water supply, use is made of the water for irrigation of potatoes. Aroostook County is renowned as a potato-producing area.

Much of the 90-square-mile drainage is forested and provides a pleasing setting for the lake.

III. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry:

1. Surface area: 6,000 acres.
2. Mean depth: 44 feet.
3. Maximum depth: 163 feet.
4. Volume: 264,000 acre/feet.
5. Mean hydraulic retention time: 3.2 years.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area†	Mean flow†
McLean Brook	15.4 mi^2	23.3 cfs
Little River	12.5 mi^2	16.0 cfs
Minor tributaries & immediate drainage -	53.1 mi^2	73.6 cfs
Totals	81.0 mi^2	112.9 cfs

2. Outlet -

Long Lake outlet	90.4 mi^2*	112.9* cfs

C. Precipitation**:

1. Year of sampling: 45.8 inches.
2. Mean annual: 36.3 inches.

---

* Includes area of lake; outflow adjusted to equal sum of inflows.
** See Working Paper No. 1, "Survey Methods".
† Drainage areas are accurate within ±1% and mean annual flows within ±5%.

IV. LAKE WATER QUALITY SUMMARY

Long Lake was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (15 feet or near bottom to surface) sample was composited from the three stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited for algal assays. Also, each time depth-integrated samples were collected at the stations for chlorophyll a analyses. Maximum depths sampled were 15 feet at station 1, 14 feet at station 2, and 73 feet at station 3.

It should be noted that the Survey Secchi disc values are consistently less than those observed by the Maine Department of Environmental Protection. Such variations could be attributed to fluctuations in cloud cover or sun angle (ambient light conditions), observer technique, water surface disturbance, or may, in fact, be the result of short-term water clarity differences.

It should also be noted that Survey sampling to 40 feet at station 3 in August did not reveal oxygen depression. However, Matthew Scott of the Maine Department of Environmental Protection advises that the thermocline in this lake ordinarily is quite deep by August. The water temperatures show that none of the Survey samples were collected even as deep as the

thermocline, and thus the oxygen depression with depth observed by Maine agencies was not detected.

The results obtained are presented in full in Appendix B; and the data for the fall sampling period, when the lake was essentially well-mixed, are are summarized below. Note, however, the Secchi disc summary is based on all samples.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

FALL VALUES

(09/28/72)

Parameter	Minimum	Mean	Median	Maximum
Temperature (Cent.)	12.9	13.2	13.2	13.6
Dissolved oxygen (mg/l)	7.2	8.9	9.2	9.6
Conductivity (μmhos)	80	81	80	85
pH (units)	7.3	7.4	7.4	7.4
Alkalinity (mg/l)	26	28	28	29
Total P (mg/l)	0.010	0.012	0.012	0.012
Dissolved P (mg/l)	0.006	0.007	0.007	0.008
NO_2 + NO_3 (mg/l)	0.080	0.089	0.090	0.100
Ammonia (mg/l)	0.060	0.069	0.070	0.070

ALL SAMPLES

Secchi disc (inches)	76	104	109	132

B. Biological characteristics:

1. Phytoplankton* -

Sampling Date	Dominant Genera	Number per ml
06/06/72	1. Asterionella	172
	2. Flagellates	169
	3. Dinobryon	130
	4. Anabaena	75
	5. Melosira	57
	Other genera	181
	Total	784
09/28/72	1. Polycystis	3,585
	2. Chroococcus	2,642
	3. Anabaena	2,113
	4. Flagellates	943
	5. Synedra	717
	Other genera	2,453
	Total	12,453

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
06/06/72	01	3.3
	02	5.3
	03	3.8
08/08/72	01	4.3
	02	4.4
	03	4.2
09/28/72	01	8.6
	02	13.7
	03	14.6

* The August phytoplankton sample was lost in transit.

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.002	0.154	0.1
0.006 P	0.008	0.154	5.0
0.012 P	0.014	0.154	-*
0.024 P	0.026	0.154	4.9
0.060 P	0.062	0.154	4.5
0.060 P + 10.0 N	0.062	10.154	16.2
10.0 N	0.002	10.154	0.1

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, shows that the potential primary productivity in Long Lake was quite low at the time the sample was collected. Also, the increased yield resulting from the first increment of orthophosphorus shows the lake was phosphorus limited (note that the addition of only nitrogen did not produce a greater yield than the control). The field data obtained also indicate phosphorus limitation at all sampling times; nitrogen/phosphorus ratios ranged from 23/1 to 64/1 (i.e., phosphorus limitation would be expected).

The assay results also indicate that only a relatively small increase in phosphorus concentration in Long Lake would result

* The yields resulting from this spike were so low in each of the three replicates that the data cannot be considered reliable; this may have resulted from an inadvertent omission of the spike.

in nitrogen limitation. Note that after the first phosphorus spike, succeeding increments of phosphorus did not result in increased yields, but that when both nitrogen and phosphorus were added, the yield increased markedly.

The algal assay results, then, indicate a slight phosphorus limitation at the time the sample was taken despite the field N/P ratio of 23 to 1. This reflects such a low level of primary nutrients in the lake that only a minor change in the level of phosphorus would cause a shift to nitrogen limitation.

D. Trophic Condition:

Though the algal assay control yield was quite low as were the levels of primary nutrients, Survey sampling in the lake waters was insufficient to reveal the oxygen depression apparent at depth reported by Maine biologists.* Including those data, it is concluded that Long Lake is mesotrophic.

*See discussion on pages 4 & 5; Data in Appendix B

V. NUTRIENT LOADINGS*
(See Appendix B for data)

For the determination of nutrient loadings, from September 1972 through July 1973, the Maine National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May, when two samples were collected, and the colder months of the year when one or more samples were omitted.

Through an interagency agreement, estimated flows for the year of sampling and a "normalized" or average year were provided by the Maine District Office of the U. S. Geological Survey for the tributary sites nearest the lake.

In this report, tributary nutrient loads were calculated using mean concentrations and mean flows. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were calculated using the mean concentrations in McLean Brook at station B-1 and mean ZZ flows.

The operator of the St. Agatha Sanitary District wastewater treatment plant provided composited effluent samples and flow data on a monthly basis.

A. Waste Sources:

1. Municipal -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
St. Agatha S.D.	450	Act. sludge	0.040	Long Lake

* Based on sampling frequency and variations in concentrations, single tributary loadings for gaged sites are believed to be within ±16% of the true value 67% of the time and within ±32% of the true value 95% of the time.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
McLean Brook	870	13.2
Little River	940	14.2
b. Minor tributaries & immediate drainage (non-point load)* -	2,750	41.7
c. Municipal STP's -		
St. Agatha S.D.	640	9.7
d. Septic tanks** -	460	7.0
e. Industrial -		
Unknown	-	-
f. Direct Precipitation* -	940	14.2
Total	6,600	100.0

2. Outputs -

Long Lake outlet 2,890

3. Net annual P accumulation - 3,710 lbs.

* Estimated; see Working Paper No. 1, "Survey Methods".
** Estimated 735 residences within 100 yards of lake, including camps.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load -		
McLean Brook	65,410	16.6
Little River	45,100	11.4
b. Minor tributaries & immediate drainage (non-point load)* -	206,620	52.4
c. Municipal STP's -		
St. Agatha S.D.	1,930	0.5
d. Septic tanks** -	17,270	4.4
e. Industrial -		
Unknown	-	-
f. Direct precipitation* -	57,800	14.7
Total	394,130	100.0

2. Outputs -

Long Lake outlet 155,140

3. Net annual N accumulation - 238,990 lbs.

* Estimated; see Working Paper No. 1, "Survey Methods".
** Estimated 735 residences within 100 yards of lake, including camps.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
McLean Brook	56	4,247
Little River	75	3,608

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (1973). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	1.1	0.6	65.7	39.8
grams/m^2/yr	0.12	0.07	7.4	4.5

Vollenweider loading rates for phosphorus (g/m^2/yr) based on the mean depth and mean hydraulic retention time of Long Lake:

"Dangerous" (eutrophic rate)	0.40
"Permissible" (oligotrophic rate)	0.20

F. Controllability of Nutrients:

1. Discussion -

During the sampling year, Long Lake was receiving a phosphorus loading at a rate less than that proposed as permissible by Vollenweider (1973). However, if the loading rate is in-

creased by only 0.7 lbs/acre/yr, or 4,200 lbs/yr for the entire lake, the permissible limit would be reached. This points to the need for continued assessment of cultural practices within the Long Lake drainage to insure that the existing trophic condition of the lake is maintained.

It is noted that the non-point nutrient export loads to Long Lake (see page 12) were somewhat greater than those to the other natural Maine lakes studied (all within the same time frame). It is not known whether this is due to the intensive potato production in the drainage, but it would seem desirable to study the possibility in greater depth than was possible during the Survey.

At this time, the only point source of phosphorus, other than septic tanks, is the St. Agatha Sanitary District waste treatment facility which contributed a little less than 10 percent of the phosphorus load to Long Lake during the sampling year. While the institution of 80% phosphrus removal at St. Agatha would reduce the total phosphorus loading to the lake by about 0.09 lbs/acre/yr (0.01 $g/m^2/yr$), and thus provide an additional margin of safety, it is not likely that such removal would result in any observable change in the present trophic condition of Long Lake.

VI. LITERATURE REVIEWED

Anonymous, 1953. Long Lake survey report. Dept. Inland Fisheries & Game, Augusta.

Hinckley, William P., 1973. Personal communication (St. Agatha S.D. facility; Long Lake drainage characteristics). Dept. of Environmental Protection, Augusta.

Scott, Matthew, 1974. Personal communication (Long Lake shoreline survey; stratification and trophic state of lake). Dept. of Environmental Protection, Augusta.

Vollenweider, Richard A., 1973. Input-output models. MS, Canada Centre for Inland Waters, Burlington, Ontario.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR MAINE 6/25/74

LAKE CODE 2313 LONG LAKE (APOOSTOOK CO.)

TOTAL DRAINAGE AREA OF LAKE 90.40

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2313A1	90.40	82.00	74.00	201.00	379.00	187.00	68.00	24.00	19.00	25.00	38.00	145.00	110.00	112.53
2313B1	15.40	12.00	8.50	18.00	84.00	50.00	15.00	7.30	6.30	8.30	13.00	34.00	23.00	23.27
2313C1	12.50	9.70	9.90	35.00	61.00	20.00	7.20	2.70	1.70	3.30	4.90	24.00	14.00	16.04
231327	62.50	61.00	56.00	148.00	234.00	118.00	45.00	15.00	11.00	14.00	21.00	88.00	73.00	73.58

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 90.40
SUM OF SUB-DRAINAGE AREAS = 90.40

TOTAL FLOW IN = 1356.30
TOTAL FLOW OUT = 1352.00

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2313A1	9	72	64.00	16	47.00				
	10	72	74.00	14	72.00				
	11	72	164.00	4	241.00				
	12	72	133.00	4	128.00				
	1	73	133.00	5	118.00				
	2	73	292.00	3	324.00				
	3	73	1010.00	2	454.00				
	4	73	750.00	7	285.00	21	1520.00		
	5	73	243.00	4	386.00	19	136.00		
	6	73	73.00	10	70.00				
	7	73	19.00	14	17.00	31	12.00		
	8	73	28.00						
2313B1	9	72	21.00	16	16.00				
	10	72	25.00	14	24.00				
	11	72	38.00	4	56.00				
	12	72	28.00	4	27.00				
	1	73	19.00	5	17.00				
	2	73	33.00	3	37.00				
	3	73	91.00	2	41.00				
	4	73	166.00	7	63.00	21	335.00		
	5	73	65.00	4	103.00	19	36.00		
	6	73	16.00	10	15.00				
	7	73	5.70	14	5.20	31	3.50		
	8	73	9.40						

TRIBUTARY FLOW INFORMATION FOR MAINE 6/25/74

LAKE CODE 2313 LONG LAKE (AROOSTOOK CO.)

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2313C1	9	72	8.40	16	5.20				
	10	72	10.00	14	9.70				
	11	72	27.00	4	40.00				
	12	72	17.00	4	16.00				
	1	73	16.00	5	14.00				
	2	73	39.00	3	43.00				
	3	73	176.00	2	79.00				
	4	73	121.00	7	46.00	21	244.00		
	5	73	26.00	4	41.00	19	15.00		
	6	73	7.80	10	7.50				
	7	73	1.70	14	1.60	31	1.00		
	8	73	2.60						
2313ZZ	9	72	36.00						
	10	72	41.00						
	11	72	99.00						
	12	72	88.00						
	1	73	99.00						
	2	73	221.00						
	3	73	744.00						
	4	73	463.00						
	5	73	153.00						
	6	73	49.00						
	7	73	12.00						
	8	73	16.00						

APPENDIX B

PHYSICAL AND CHEMICAL DATA

K - Value is less than indicated
J - Value known to be in error

STORET RETRIEVAL DATE 74/06/25

231301
47 14 42.0 068 18 18.0
LONG LAKE
23 MAINE

11EPALES
3

2111202
0013 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/06	08 25	0000	11.9	10.0	96	80	7.30	23	0.300	0.050	0.012	0.008
	08 25	0012	11.4	11.0		90	7.30	24	0.330	0.040	0.010	0.004
72/08/08	15 00	0000			113	92	7.40	26	0.140	0.070	0.008	0.005
	15 00	0004	18.4	9.0		90	7.40	27	0.140	0.060	0.007	0.005
	15 00	0015	18.4	9.2		90	7.30	27	0.130	0.060	0.006	0.005
72/09/28	12 12	0000				85	7.35	29	0.100	0.070	0.011	0.008
	12 12	0004	13.0	9.2		83	7.40	28	0.100	0.070	0.011	0.006
	12 12	0010	12.9	7.2		83	7.40	29	0.100	0.070	0.012	0.007

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/06	08 25	0000	3.3J
72/08/08	15 00	0000	4.3J
72/09/28	12 12	0000	8.6J

STORET RETRIEVAL DATE 74/06/25

231302
47 10 18.0 068 15 18.0
LONG LAKE
23 MAINE

11EPALES
3

2111202
0014 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/06	08 45	0000	12.8	11.2	108	80	7.50	22	0.240	0.040	0.018	0.004
	08 45	0014	12.6	11.2		80	7.50	22	0.230	0.030	0.004	0.003
72/08/08	14 45	0000			109	90	7.30	28	0.140	0.070	0.007	0.007
	14 45	0004	18.3	9.0		90	7.20	26	0.140	0.070	0.009	0.006
	14 45	0012	18.2	9.0		90	7.10	26	0.140	0.060	0.005	0.002
72/09/28	11 50	0000			77	82	7.40	28	0.090	0.070	0.012	0.008
	11 50	0004	13.0	8.0		80	7.40	27	0.090	0.070	0.011	0.006
	11 50	0010	12.9	9.4		80	7.40	28	0.100	0.070	0.010	0.007

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/06	08 45	0000	5.3J
72/08/08	14 45	0000	4.4J
72/09/28	11 50	0000	13.7J

STORET RETRIEVAL DATE 74/06/25

231303
47 10 42.0 068 11 30.0
LONG LAKE
23 MAINE

11EPALES
3

2111202
0075 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/06	09 06	0000	12.0	10.3	120	80	7.50	24	0.260	0.050	0.006	0.005
	09 06	0073	4.9	10.2		80	7.00	22	0.270	0.070	0.010	0.004
72/08/08	15 25	0000			132	90	7.40	26	0.120	0.070	0.005	0.007
	15 25	0004	18.4	7.8		90	7.40	27	0.140	0.060	0.005	0.005
	15 25	0015	18.4	9.0		90	7.40	27	0.140	0.060	0.006	0.004
	15 25	0020	18.1	6.8		90	7.20	26	0.130	0.070	0.006	0.005
	15 25	0030	17.2	10.8		90	7.20	26	0.130	0.050	0.007	0.004
	15 25	0040	17.2	8.2		90	7.00	26	0.180	0.060	0.005	0.004
72/09/28	11 11	0000			76	80	7.40	28	0.080	0.060	0.012	0.007
	11 11	0004	13.6	9.3		80	7.35	27	0.080	0.070	0.012	0.007
	11 11	0015	13.6	9.0		80	7.30	27	0.080	0.070	0.012	0.006
	11 11	0035	13.5	9.2		80	7.30	26	0.080	0.070	0.012	0.007
	11 11	0055	13.4	9.6		80	7.30	26	0.080	0.070	0.012	0.007

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/06	09 06	0000	3.8J
72/08/08	15 25	0000	4.2J
72/09/28	11 11	0000	14.6J

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

K - Value is less than indicated
J - Value known to be in error

STORET RETRIEVAL DATE 74/06/25

2313A1 LS2313A1
47 10 00.0 068 16 00.0
OUTLET OF LONG LAKE
23 15 SQUARE LAKE
O/LONG LK-AROOSTOCK CO.
BARN BROOK RD BRDG IN SINCLAIR
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/16	09 05		0.120	0.325	0.054	0.005K	0.012
72/10/14	09 05		0.117	0.350	0.058	0.005K	0.011
72/11/04	08 30		0.312	0.820	0.034	0.005K	0.011
72/12/04	10 31		0.176	0.360	0.020	0.005K	0.012
73/02/03	09 15		0.220	0.800	0.050	0.006	0.010
73/03/02	19 30		0.210	0.310	0.015	0.005K	0.010
73/04/07	09 30		0.390	0.550	0.033	0.005K	0.010
73/04/21	09 00		0.500	0.340	0.016	0.005K	0.015
73/05/04	09 30		0.680		0.074	0.005K	0.015
73/05/19	09 00		0.231	0.320	0.007	0.005K	0.015
73/07/14	08 00		0.132	0.270	0.027	0.005K	0.010
73/07/31	18 00		0.042	0.880	0.054	0.005K	0.025

STORET RETRIEVAL DATE 74/06/25

231381 LS231381
47 10 30.0 068 16 00.0
MCLEAN BROOK
23 15 SQUARE LAKE
T/LONG LK-AROOSTOCK CO
BRDG NNE OF SINCLAIR
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/16	09 15		0.833	0.650	0.170	0.007	0.020
72/10/14	09 20		0.800	0.600	0.138	0.005K	0.015
72/11/04	08 45		0.793	0.770	0.030	0.005K	0.010
73/04/07	09 35		1.240	0.740	0.042	0.005K	0.010
73/04/21	09 00		0.840	0.480	0.016	0.006	0.020
73/05/04	09 15		0.990	0.620	0.027	0.005K	0.015
73/05/19	08 50		0.510	0.790	0.054	0.011	0.020
73/06/10	08 20		0.470	0.660	0.044	0.005K	0.035
73/07/14	09 15		0.044	1.000	0.071	0.006	0.030

STORET RETRIEVAL DATE 74/06/25

2313C1 LS2313C1
47 15 30.0 068 16 00.0
LITTLE RIVER
23 15 FRENCHVILLE
T/LONG LK-AROOSTOCK CO
BIRCH PT RD BRDG SW OF CLEVELAND
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/16	09 40		0.470	0.325	0.064	0.008	0.022
72/10/14	09 55		1.000	0.325	0.120	0.005K	0.014
72/11/04	09 40		0.750	0.520	0.027	0.005K	0.013
72/12/04	11 23		1.220	0.740	0.038	0.007	0.021
73/04/07	09 55		1.520	0.340	0.022	0.005K	0.015
73/04/21	09 30		1.160	0.520	0.022	0.008	0.045
73/05/04	09 00		0.760	0.500	0.018	0.006	0.025
73/05/19	08 25		0.720	0.660	0.034	0.011	0.030
73/06/10	09 00		0.780	0.690	0.029	0.008	0.030
73/07/14	08 45		0.690	0.630	0.037	0.008	0.020
73/07/31	18 30		0.750		0.870	0.011	0.090

STORET RETRIEVAL DATE 74/06/25

231350 AS231350 P000900
47 15 00.0 068 18 30.0
ST AGATHA
23 15 SQUARE LAKE
D/LONG LAKE
LONG LAKE
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
63/01/25	12 00								
CP(T)-			0.630	18.000	3.400	4.225	5.700		0.006
73/01/25	11 00								
73/02/27	11 00								
CP(T)-			0.165	26.000	12.800	7.500	8.600	0.017	
73/02/28	10 00								
73/03/22	11 00								
CP(T)-			2.700	9.950	2.400	1.580	2.800	0.076	0.059
73/03/23	10 00								
73/04/25	11 00								
CP(T)-			3.800	4.200	0.400	0.560	1.250		
73/04/26	10 00								
73/05/24	10 30								
CP(T)-			3.400	8.800	0.750	1.890	3.350	0.045	0.050
73/05/25	09 30								
73/06/22	11 00		3.500	21.000	1.140	5.600	7.600	0.060	0.060
73/08/01	10 00		0.210	5.300	0.660	4.400	5.800	0.035	0.039
73/08/28	14 30		0.260	18.000	2.900	6.000	7.900	0.023	0.023
73/10/11	11 45								
CP(T)-			0.220	11.000	2.000	3.780	5.200	0.044	0.041
73/10/12	10 45								
73/10/31	13 00								
CP(T)-			0.350	42.000	14.400	8.600	13.500	0.031	0.041
73/11/01	12 00								
73/12/03	12 00								
CP(T)-			0.230	29.000	9.800	6.700	8.900	0.035	0.033
73/12/04	11 00								
74/01/04	11 00								
CP(T)-			2.320	15.500	3.680	3.840	5.300	0.049	0.120
74/01/05	10 00								